



In re United States Patent Application of:

Applicants: **SHIMURA, Tokihiro**

Application No.: 10/690,073

Date Filed: October 21, 2003

**Title: ABRASIVE, AND ABRASIVE
MANUFACTURING
METHOD AND DEVICE**

23448

**Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450**

I, Tokihiro Shimura, hereby declare:

1. THAT I am the sole inventor of the subject matter disclosed and claimed in United States Patent Application No. 10/690,073 filed on October 21, 2003 in the United States Patent and Trademark Office, entitled "ABRASIVE, AND ABRASIVE MANUFACTURING METHOD AND DEVICE," hereafter referred to as the "Application."

2. THAT the Application as originally filed broadly discloses and claims abrasives composed of metal inorganic powders and that the Application broadly claims such devices in the following independent claims 1, 23, and 24:

1. An abrasive composed of an inorganic metal powder that contains at least one of not more than 1.5 wt% boron, not more than 0.1 wt% aluminum and not more than 0.1 wt% titanium, and meets all the following conditions:

- (1) its true specific gravity is 4 g/cm^3 or more;
- (2) its average particle diameter is from $5 \text{ }\mu\text{m}$ to $50 \text{ }\mu\text{m}$ inclusive;
- (3) its maximum particle size is $100 \text{ }\mu\text{m}$ or less;
- (4) its hardness (HNV) is from 110 to 340 inclusive,

with the proviso that when the inorganic metal powder contains titanium in the absence of boron and aluminum, the inorganic metal powder further contains silicon in an amount of at least 0.8 [[0.7]] wt%.

23. An abrasive manufactured by an abrasive manufacturing method comprising the steps of:

causing molten inorganic metal containing at least one of not more than 1.5 wt% boron, not more than 0.1 wt% aluminum and not more than 0.1 wt% titanium contained in a tundish including an ejecting nozzle to eject from the ejecting nozzle, with the proviso that when the molten inorganic metal contains titanium in the absence of boron and aluminum, the molten inorganic metal further contains silicon in an amount of at least 0.8 [[0.7]] wt%; and

ejecting a pressurized fluid onto the molten metal ejected from the ejecting nozzle in such a manner that the pressurized fluid will form a conical shape, which converges downwards, and will surround the molten metal, thereby powdering the molten metal;

wherein the conical shape that is formed by ejection of the pressurized fluid has a vertex angle that is set between not less than 10 degrees and less than 30 degrees.

24. An abrasive manufactured by a method including use of an abrasive manufacturing device, said abrasive comprising an inorganic metal powder containing at least one of not more than 1.5 wt% boron, not more than 0.1 wt% aluminum and not more than 0.1 wt% titanium, with the proviso that when the inorganic metal powder contains titanium in the absence of boron and aluminum, the inorganic metal powder further contains silicon in an amount of at least 0.8 [[0.7]] wt%, said inorganic metal powder having (i) a true specific gravity of at least 4 g/cm^3 , (ii) an average particle diameter in a range of from $5 \text{ }\mu\text{m}$ to $50 \text{ }\mu\text{m}$ inclusive, (iii) a maximum particle size not exceeding $100 \text{ }\mu\text{m}$, and (iv) an HNV hardness in a range of from 110 to 340 inclusive, said method comprising :

- (1) providing said abrasive manufacturing device, comprising:
 - a tundish for containing molten metal containing at least one of boron, aluminum and titanium;

an ejecting nozzle mounted on the tundish to cause the molten metal contained in the tundish to eject out; and

an atomizing nozzle for ejecting a pressurized fluid onto the molten metal ejected from the ejecting nozzle in such a manner that the pressurized fluid will form a conical shape, which converges downwards, and will surround the molten metal;

wherein the atomizing nozzle causes the pressurized fluid to eject so that the conical shape that is formed by ejection of the pressurized fluid has a vertex angle that is between not less than 10 degrees and less than 30 degrees;

(2) causing said molten metal to eject from the ejecting nozzle; and

(3) ejecting said pressurized fluid onto the molten metal ejected from the ejecting nozzle to surround and powder the molten metal, thereby forming said abrasive.

3. THAT I am aware that the Application has been examined by the United States Patent and Trademark Office, that I am aware that an Office Action was issued on June 14, 2006 by the United States Patent and Trademark Office, and that I am aware that the claims of the Application as reproduced herein have been rejected on various prior art grounds, including grounds replying upon the disclosure of U.S. Patent No. 6,712,873 to Bergkvist et al. ("Bergkvist '873")..

4. THAT I have been informed by my legal representatives that the rejections of the claims of the Application can be overcome by presenting evidence to the United States Patent and Trademark Office of my possession of our claimed invention prior to the effective date of the reference identified in Paragraph 3, and that said effective date has been identified to me by such legal representatives as June 14, 2002 (such date hereafter being referred to as the "Effective Date").

5. THAT attached in Exhibits 1A and 1B hereof are (Exhibit 1A) a true and exact copy of a Japanese language three-page memorandum, with the addition of the identifier "Evidence 1"

at upper left subsequently added thereto, and (Exhibit 1B) an accurate English language translation of pertinent portions thereof, documenting an internal meeting regarding development of the abrasives composed of metal inorganic powders, on which documents all dates (i.e., appearing on page 1/3 thereof) have been blacked out, but which dates are prior to the Effective Date as listed hereinabove; that such memorandum refers in pertinent part (i.e., at page 3/3) to:

“(1) Atomization conditions” at an “angle $\rightarrow 30^{\circ} \rightarrow 20^{\circ} \rightarrow 10^{\circ}$ ” and “pressure;”

“(2) Steel components” of “410 M/C (C – 0.2%)” \rightarrow Concept of hardness C 0.01, Si 0.8, Mn 0.8, [and] Cr 12.5;” and

(3) “Addition of boron 410L+B;”

and further contains a Table at page 3/3 thereof depicting various “Demanded qualit[ies]” – namely, “Single particle,” “Spheroidizing,” “-10 μ m,” “Hardness,” and “Heat resistance” – versus four “Proposed components” – namely, “(1) 410 M/C,” “410L+B,” “436L,” and “Current status SUH21.”

6. THAT attached in Exhibits 2A and 2B hereof are (Exhibit 2A) a true and exact copy of a Japanese language three-page document entitled “Improvement of quality of S9#1000 blast material,” with the addition of the identifier “Evidence 2” at upper left subsequently added thereto, and (Exhibit 2B) an accurate English language translation of pertinent portions thereof, documenting an atomization test, on which documents all dates have been blacked out, but which dates are prior to the Effective Date as listed hereinabove, that such documents state in pertinent part:

(2) Test for improvement (first)

An atomization test was conducted with two standards of component systems. The selection of components was made with the aim of obtaining particles with a rounded shape. ...

(3) Test results

(3-1) Shapes (SEM photographs)

(A) Comparison between the current product, improved products (1) and (2)

* * *

Both improved products (1) and (2) contain many fine powders with a particle size of 10 μ m or less because the particle size is measured before adjustment. Many of the large particles form aggregated (granulated) powders.

(B) State in which fine powders have been removed: (state in which the particle size has been adjusted to 20 to 70 microns) 325/625 mesh product

* * *

(3-2) Comparison of powder hardness

The powder hardnesses of the three kinds of products (i.e., the current product, improved product (1) and improved product (2) are under research. (The results will be confirmed on [DATE OMITTED]).

7. THAT attached in Exhibits 3A and 3B hereof are (Exhibit 3A) a true and exact copy of a Japanese language single-page document entitled "Certificate of Test," with the addition of the identifier "Evidence 3" at upper left subsequently added thereto, and (Exhibit 3B) an accurate English language translation of pertinent portions thereof, documenting an atomization test, on which documents all dates have been blacked out, but which dates are prior to the Effective Date as listed hereinabove, that such documents provide in pertinent part:

Certificate of Test

* * *

Product name: stainless steel powder

* * *

Chemical component (mass %)	Standard value	Result value
C	MAX 0.150	0.059

	Si	MAX 1.00	0.80
	Mn	MAX 1.00	0.81
	P	MAX 0.040	0.017
	S	MAX 0.030	0.007
	Ni	MAX 0.60	0.13
	Cr	11.00~13.50	12.39
	O (ppm)	<i>(not translated)</i>	2500
<i>(not translated)</i>	B	MAX 0.5	0.3

Physical property

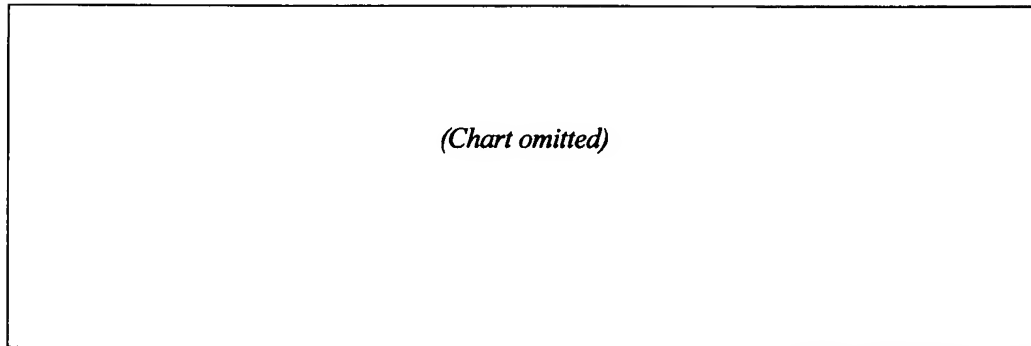
Particle size distribution (mass %)		Standard value	Result value
Over 70	μm	<i>(not translated)</i>	2.1
70-60	μm	<i>(not translated)</i>	2.1
60-50	μm	<i>(not translated)</i>	5.0
50-30	μm	<i>(not translated)</i>	25.2
30-10	μm	<i>(not translated)</i>	55.9
10-5	μm	<i>(not translated)</i>	7.3
5-	μm	<i>(not translated)</i>	1.4
Averaged particle	μm	<i>(not translated)</i>	24.26
Tap density	g/cm ³	<i>(not translated)</i>	4.56

8. THAT attached in Exhibits 4A and 4B hereof are (Exhibit 4A) a true and exact copy of a Japanese language one-page document entitled "Test results of particle size distribution" with the addition of the identifier "Evidence 4" at upper left subsequently added thereto, and (Exhibit 4B) an accurate English language translation of pertinent portions thereof,

documenting test results for particle size distribution” on which documents all dates have been blacked out, but which dates are prior to the Effective Date as listed hereinabove, that such documents provide in pertinent part:

[%] Frequency

Accumulating total [%]

Particle diameter [μm]

(CH)	Particle diameter (μm)	Accumulating total (%)	Frequency (%)
1	1.00	0.00	0.00
2	2.00	0.00	0.00
3	3.00	0.00	0.00
4	4.00	0.13	0.13
5	5.00	1.44	1.31
6	10.00	8.70	7.25
7	15.00	21.84	12.64
8	20.00	37.03	15.69
9	25.00	51.45	14.42

10	30.00	64.60	13.15
11	40.00	80.37	15.77
12	50.00	89.81	9.44
13	60.00	95.60	5.98
14	70.00	97.92	2.12
15	80.00	99.08	1.15
16	100.00	100.00	0.92

9. THAT such disclosure in Exhibits 1A-4B about metal inorganic powders, including disclosure of such powders provided at "Atomization conditions" at an "angle $\rightarrow 30^\circ \rightarrow 20^\circ \rightarrow 10^\circ$ " and "pressure;" with "Steel components" of "410 M/C (C - 0.2%)" \rightarrow Concept of hardness [including] C 0.01, Si 0.8, Mn 0.8, [and] Cr 12.5" and "Addition of boron;" with consideration given to several "[d]emanded quality[ies]" - namely, "single particle," "spheroidizing," "-10 μ m," "hardness," and "heat resistance;" produced by "atomization" ... "with the aim of obtaining particles with a rounded shape" to provide powders with particles including component percentages of "C 0.059; Si 0.80; Mn 0.81; P 0.017; S 0.007; Ni 0.13; Cr 12.39; and B 0.3" (Exhibits 3A-3B); with the powders ranging in size from "10 μ m or less" (Exhibits 1A-1B), "20 to 70 microns" (Exhibits 2A-2B), 5 to 70 μ m (Exhibits 3A-3B), and 5 to 100 microns (Exhibits 4A-4B); in the aggregate evidences conception of the inventive subject matter in claims 1, 23, and 24 of the Application, which relate to abrasives composed of metal inorganic powders as provided hereinabove.

As a below-named declarant, I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements, and the like, so made are punishable by fine or imprisonment, or both, under Section 1001 or Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Respectfully submitted,


TOKIHIRO SHIMURA

Dated: Oct. 04, 2006

EXHIBIT 1A

3/4(木) F.H.P 股向 Sutt-2 | 90° 1. 度 12.

(参考) F#P 客時 謝金也 印券)

(4) 現狀面、便所状況、汚染問題

④ 便用性()
7-2米/分=7100(米/分)

④ 問題 4. 入量 500g の Ca^{2+} 100% 250g 程度
 500g の Ca^{2+} 100% 250g 程度。

馬六甲西門，安南之南，及馬六甲西門之南。
及馬六甲西門之南。

[illegible]

Dr. H. P. Gold (USA)

(A) 改定稿 (2007.12.14)

① 聖和公の二子、聖和公、聖和公。

© 1999 北京新地技术有限公司

⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒ ㉓ ㉔ ㉕ ㉖ ㉗ ㉘ ㉙ ㉚ ㉛ ㉜ ㉝ ㉞ ㉟ ㊱ ㊲ ㊳ ㊴ ㊵ ㊶ ㊷ ㊸ ㊹ ㊺ ㊻ ㊼ ㊽ ㊾ ㊿

Abstract

我人等

(通海) 通海縣志

① 上海第一中學

② 44-611 65-6297

1. 对美、日提法

Итого 70 %

3

सं. १०८५-१३५६०५५८

100

Age Group	1970	1980	1990	2000	2010	2020
0-14	25	22	18	15	12	10
15-24	18	16	14	12	10	8
25-34	12	10	8	6	4	3
35-44	8	6	4	3	2	1
45-54	5	4	3	2	1	0
55-64	3	2	1	0	0	0
65-74	10	12	15	18	22	25
75+	2	3	4	5	6	7

•

Journal of Management Education 30(6)

100

[illegible]

(
 腹
 大腸
 小腸
 胃
 肝
 脾
 肺
 腎
 心
 胆
 膀胱
 三焦
 命門
 子宮
 陰道
 陰囊
 睪丸
 精索
 輸尿管
 尿道
 陰莖
 陰毛
 腋毛
 手毛
 足毛
 汗毛
 指甲
 趾甲
 頭髮
 眉毛
 睫毛
 耳毛
 鼻毛
 唇毛
 鬍鬚
 胡子
 體毛
 皮膚
 肌肉
 骨骼
 關節
 神經
 血管
 淋巴管
 腺體
 內分泌
 消化系統
 呼吸系統
 泌尿系統
 生殖系統
 循環系統
 運動系統
 免疫系統
 神經系統
 感覺器官
 運動器官
 排泄器官
 調節器官
 防禦器官
 營養器官
 繁殖器官
 發育器官
 衰老器官
 死亡器官
)

$\text{O} \rightarrow \text{B}$

林在少發

$\frac{z}{2} = \frac{1+i}{\sqrt{2}}$ 3/10日 金曜日

...

1968

—

ATC-I

(1) 直前の対称

対称の量対称

① リースある (MS-5 文庫)

0-250 mark
0-325 mark

cut

⇒ 6~7 (1.5)

(18巻)

(1009)

200: 400 L (1000) 500
(100)

② 基本対称

① 浮球
② 球状化
③ 10m 少々

(原) ① アトミ燃料

酸

→ 30 → 20 → 10

電力

② 銅線

(copper) 銅線 (copper)

(non-ferrous) 銅線 (non-ferrous)

銅線 (copper)

銅線 (copper)

銅線 (copper)

銅線 (copper)

銅線 (copper)

銅線 (copper)

銅線 (copper)

銅線 (copper)

銅線 (copper)

銅線 (copper)

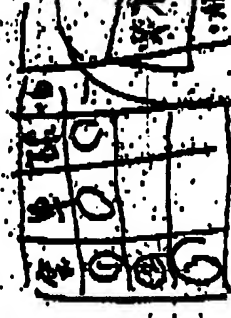
銅線 (copper)

銅線 (copper)

銅線 (copper)

銅線 (copper)

銅線 (copper)



③ 銅線

銅線

銅線

銅線

銅線

銅線

銅線

銅線

銅線

銅線

銅線

銅線

銅線

ATC-Q

速) ① 712 位料 解 助

要求品質					
成分集	單子記	強壯化	-10μm	硬工	耐熱性
① 40%	Q	○		○	Δ
② 40%+B	②	②	Δ	Δ	Δ
B: 0.50%				12.3	
③ 40%	○	○		○	○
④ 40%+B	Δ	Δ	Δ	○	○

①

③ B to A/B ② B

1.40L + B.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒ ㉓ ㉔ ㉕ ㉖ ㉗ ㉘ ㉙ ㉚ ㉛ ㉜ ㉝ ㉞ ㉟ ㊱ ㊲ ㊳ ㊴ ㊵ ㊶ ㊷ ㊸ ㊹ ㊺ ㊻ ㊼ ㊽ ㊾ ㊿

EXHIBIT 1B

Translation

Evidence 1

Page 1/3

Thursday, March 14

Regarding SUH-21 70J for FHP:

(Content of the meeting at FHP in Miyazaki on Wednesday, March 13)

Page 3/3

Proposed components	Demanded quality				
	Single particle	Spheroidizing	-10µm	Hardness	Heat resistance
(1) 410 M/C	Good	Good		Good	Fair
(2) 410L+B B: 0.50% ↑ should be confirmed	Excellent	Excellent	Fair	Fair +fragility	Fair
(3) 436L	Good	Good		Good	Good
Current status SUH21	Fair	Fair	Fair	Good	Good

(1) Atomization conditions

- angle → 30° → 20° → 10°
- pressure

(2) Steel components

410 M/C (C - 0.2%)



Concept of hardness

$$\left\{ \begin{array}{l} \text{C } 0.01 \\ \text{Si } 0.8 \\ \text{Mn } 0.8 \\ \text{Cr } 12.5 \end{array} \right.$$

(3) Addition of boron
410L+B

(4) C 0.02
Si 0.8
Mn 0.8
Cr 17.5
Mo 0.9
Ni 0.4

EXHIBIT 2A

S9#1000 プラスト材の品質改善対策

2002年8月22日

(株) アトミックス 粉末製造部

現在、九州 FHP 社様にて使用して頂いている「プラスト材 S9#1000」に関して、

- ・ 凝集粉末が多く、単一粒子が少ない。
- ・ 形状的に丸みが少ない。
- ・ 使用時に凝集粒子が分裂し微粉末の割合が多くなる。

等の問題点が提起されております。

これらの、問題点を解決する為の粉末製造プロセスの改善を行い、お客様の満足度をより高めることを目的として検討し、改善を計る。

(1) 現状の問題点と原因及び対応策

問題点	原因系	対応策
①凝集粒子が多い。	材質の影響で丸くなりにくく凝集粒子が多くなる。	①融点の低い材質への変更。
	融点と熔融金属温度差が少なく分散不十分で凝集する。	②丸くなり易い材質への変更。
	アトマイズ条件が凝集防止に最適ではない。	③融点との温度差を大きくとる。
		④造粒しにくいアトマイズ条件の採用
②形状的に丸みが少ない。	材質・・・(同上)	①表面張力の大きい成分系とする。
	融点と熔融金属温度・・・(同上)	②融点との温度差を大きくとる。
	アトマイズ条件・・・(同上)	③造粒しにくいアトマイズ条件の採用。
③微粒子が多い	アトマイズ条件が微粉末が多い条件である。	①平均粒子径が大きくなるようなアトマイズ条件。
	凝集粒子が分離して微粉末がふえる。	①凝集粒子の減少

(2) 対策テスト (第一回目)

今回の第一回目のテスト；

成分系を2水準にして、アトマイズテストを実施した。

今回の成分選定は、形状的に丸くすることを狙った。丸くすることで、凝集も防止できる可能性があるのでその確認も合わせて行うこととした。

但し、アトマイズ条件は、現状のレベルと同一とした。

表-1に今回のテスト材の成分系を示す。

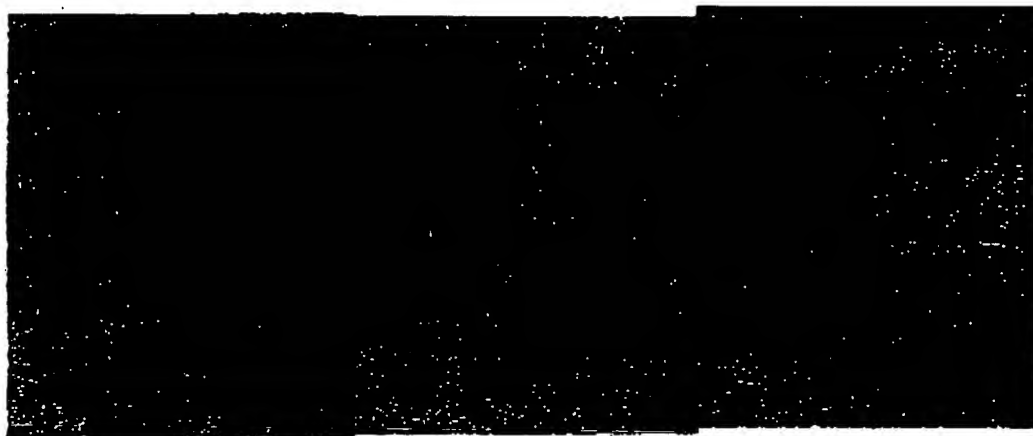
表-1 テスト材の成分系

	名称	成分系
現状品	S9#1000 70J	SUH-21 相当材 (Fe+Cr+Al+その他添加材)
対策品①	ATOP-MJ	Fe+Cr+添加材
対策品②	ATOP-MB	Fe+Cr+添加材 - B 0.3%

(3) テスト結果

8-1) 形状(SEM 写真)

(A) 現状品、対策品①、②の比較



現状品

対策品①

対策品②

対策品①、②、共に、微粉末側 (10 μ 以下の粉末) の調整前の粒度であるため、10 μ 以下の細かい粉末が多い。

また、大きい粒子では凝集 (造粒) 状態の粉末が多い。

丸さの程度は、現状品と比較すると改善されている。

(B) 微粉末を除去した状態 : (20-70 μ に調整した状態) 325/625mesh 品



対策品①



対策品②

丸い粒子と凝集している粒子が混在している。

N: W 410 11/16
C: 15/11 200

凝集している粒子は、大きい粒子に小さい粒子がくっ付いた状態のもの。

この凝集粒子の発生を防止する対策が必要となる。

3-2) 粉末の硬さ比較

現状品、対策品①、対策品②の3種類の粉末硬さの調査中。

(3月27日に結果確認予定)

(4) 今後の進め方

今回のテスト結果を踏まえて、今後の改善計画を立てる。

- ① 凝集粒子の改善・・・アトマイズ条件を変更して、凝集（造粒）を防止する。
- ② 丸さの改善・・・今回のテストにて、形状的にある程度丸くすることは可能である。この成分系にて①の改善テストを進める。
- ③ 微粒子を減少・・・凝集防止を進める。
- ④ 粉末硬さの比較・・・今回の成分系での粉末硬さを測定し、現状品に近い硬さの成分系を選定する。

以上の対策を日程を立てて実施していく。(2008年4月度)

以上。

EXHIBIT 2B

Evidence 2

Improvement of quality of S9#1000 blast material

March 22, 2002

ATMIX, Inc., Powder Production
Department

(1) Current problems, causes and improvements

[table omitted]

(2) Test for improvement (first)

This time's first test:

An atomization test was conducted with two standards of component systems.

The selection of components was made with the aim of obtaining particles with a rounded shape. There was a possibility that a rounded shape may prevent aggregation, so the confirmation of that possibility was also investigated.

However, the atomization conditions were the same as the current level.

Table 1 shows a component system for this time's test material.

Table 1: Test material component system

[table omitted]

(3) Test results

(3-1) Shapes (SEM photograph)

- (A) Comparison between the current product, improved products (1) and (2)

[photo]

[photo]

[photo]

Current product Improved product (1) Improved product (2)

Both improved products (1) and (2) contain many fine powders with a particle size of 10µm or less because the particle size is measured before adjustment.

Many of the large particles form aggregated (granulated) powders.

The degree of the roundness is improved compared to the current product.

- (B) State in which fine powders have been removed: (state in which the particle size has been adjusted to 20 to 70 microns) 325/625 mesh product

[photo]

[photo]

Improved product (1)

Improved product (2)

Rounded particles and aggregated particles coexist.

Aggregated particles are formed by small particles adhering to large particles.

Measures to prevent the occurrence of these aggregated particles will be necessary.

(3-2) Comparison of powder hardness

The powder hardnesses of the three kinds of products, i.e., the current product, improved product (1) and improved product (2) are under research. (The results will be confirmed on March 27).

EXHIBIT 3A

Evidence 3

PAGE:1

検査証明書

発行日 2002/03/30

(No. F13230137A)

需要家 : 九州エフエイチピー株式会社

品名 : ステンレス鋼パウダー
契約量 : 1kg

ロット番号 : 23V3152
鋼種記号 : ATOP-HJ
公称粒度 : PF-80F
容器数 : 1
総重量 : 1kg

化学成分 (mass %)

規格値	実値
C	MAX 0.160
Si	MAX 1.00
Mn	MAX 1.00
P	MAX 0.040
S	MAX 0.030
Ni	MAX 0.80
Cr	11.00~13.50
O (ppm)	報告 2500
B	MAX 0.5

Bは、ノウハウのため、
証明書には載せず。

物理的性質

粒度分布 (mass %)

規格値	実値
+70 μm	報告 2.1
70~60 μm	報告 2.1
60~50 μm	報告 6.0
50~30 μm	報告 25.2
30~10 μm	報告 55.9
10~5 μm	報告 7.3
-5 μm	報告 1.4
平均粒径 μm	報告 24.46
タッブ密度 g/cm ³	報告 4.56

上記注文品はご指定の規格または仕様にしたがって製造され、その要求事項を満たしていることを証明いたします。

品質管理責任者



(岡部 幸悦)

EXHIBIT 3B

Evidence 3

Certificate of Test

Date of issue: 03/30/2002

Product name: stainless steel powder

Chemical component (mass %)	Standard value	Result value
C:		
Si:		
Mn:		
P:		
S:	[data omitted]	
Ni:		
Cr:		
O (ppm)		
B		

Physical property

Particle size distribution (mass %)	Standard value	Result value
Over 70 μm		
70-60 μm		
60-50 μm		
50-30 μm	[data omitted]	
30-10 μm		
10-5 μm		
5- μm		
Averaged particle diameter μm		
Tap density g/cm ³		

We hereby certify that the above ordered product has been produced in accordance with the designated standards/specifications, and meets the requirements of the designated standards/specifications.

Quality control manager

(seal)

EXHIBIT 4A

※ ※

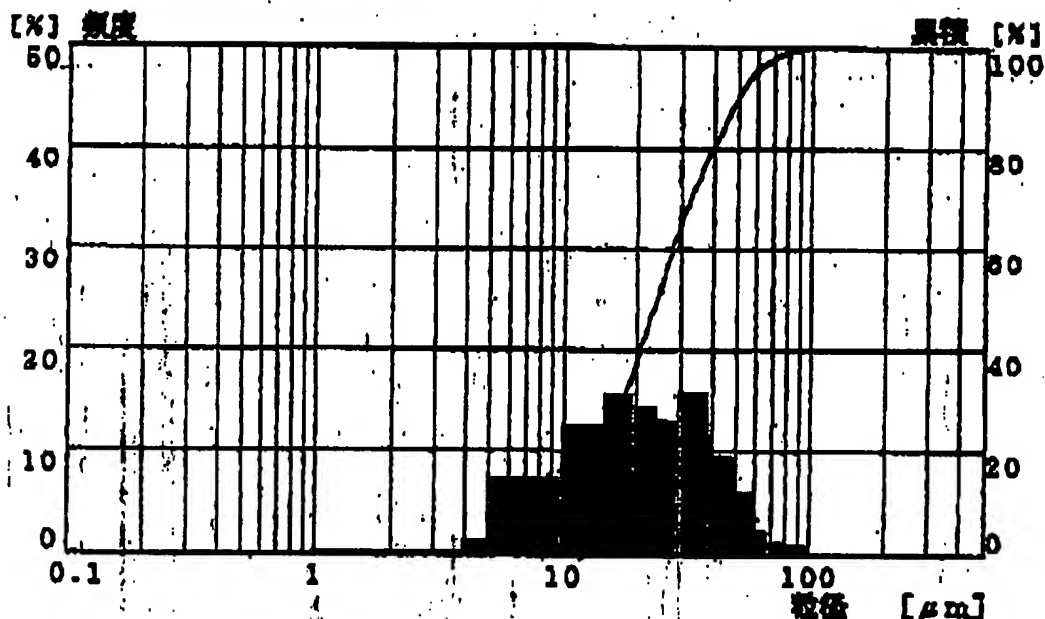
粒度分布測定結果

※ ※

CHUBTSU GRAPHITE WORKS CO., LTD.

RUN No.	0
サンプル名 (ID-1)	ATOP-MJ:PF-80F
ロットNo. (ID-2)	2SVS182
計測日付	03/29/02
計測時間	17:27

サンプルタイム	80
計測使用レンジ	0.9 - 176
データアドレス	839
コメント	
備考	任意粒度変換



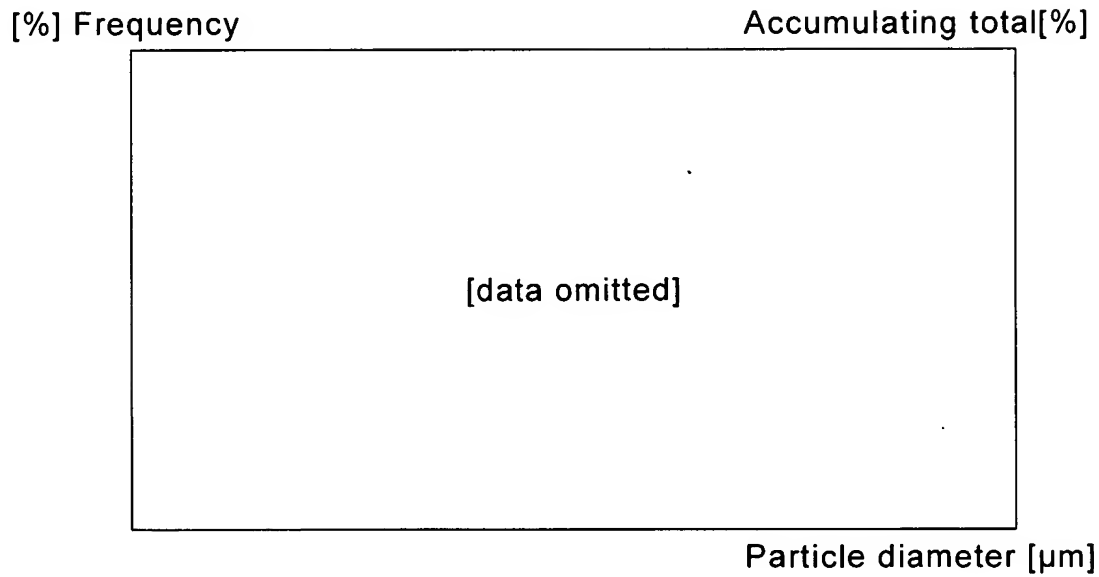
(CH)	粒度 (μm)	累積 (%)	頻度 (%)	※ 要約データ ※
1	1.00	0.00	0.00	DV = 0.1889
2	2.00	0.00	0.00	10% = 10.65
3	3.00	0.00	0.00	50% = 24.46
4	4.00	0.13	0.13	90% = 50.29
5	5.00	1.44	1.31	MV = 27.87
6	10.00	8.70	7.25	CS = 0.307
7	15.00	21.84	12.64	
8	20.00	37.03	15.69	
9	25.00	51.45	14.42	
10	30.00	64.60	13.15	
11	40.00	80.37	15.77	
12	50.00	89.81	9.44	
13	60.00	95.80	5.99	
14	70.00	97.92	2.12	
15	80.00	99.08	1.15	
16	100.00	100.00	0.92	

EXHIBIT 4B

Evidence 4

Test results of particle size distribution

Sample name (ID-1): ATOP-MJ: PF-80F
Lot No. (ID-2): 23V3152
Date of measurement: 03/29/2002
Time of measurement: 17:27



(CH)	Particle diameter (μm)	Accumulating total (%)	Frequency (%)
------	------------------------	------------------------	---------------

[data omitted]

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.